

CETIFICATION

SDG No: MC46523 Laboratory: Accutest, Massachusetts
 Site: BMS, Building 5 Area, PR Matrix: Groundwater
 Humacao, PR

SUMMARY: Groundwater samples (Table 1) were collected on the BMSMC facility – Building 5 Area. The BMSMC facility is located in Humacao, PR. Samples were taken July 10-14, 2016 and were analyzed in Accutest Laboratory of Marlborough, Massachusetts that reported the data under SDG No.: MC46523. Results were validated using the following quality control criteria of the methods employed (MADEP VPH and MAPED EPH, Massachusetts Department of Environmental Protection, 2004) and the latest validation guidelines (July, 2015) of the EPA Hazardous Waste Support Section. The analyses performed are shown in Table 1. Individual data review worksheets are enclosed for each target analyte group. The data sample organic data samples summary form shows for analytes results that were qualified.

In summary the results are valid and can be used for decision taking purposes.

Table 1. Samples analyzed and analysis performed

SAMPLE ID	SAMPLE DESCRIPTION	MATRIX	ANALYSIS PERFORMED
MC46523-1	MW-17	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC46523-1D	MW-17 MSD	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC46523-1S	MW-17 MS	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC46523-2	MW-18	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC46523-3	MW-7	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC46523-4	S-36	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC46523-5	S-36D	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC46523-6	S-37	Groundwater	Volatile TPHC Ranges Extractable TPHC Ranges
MC46523-7	S-35	Groundwater	Volatile TPHC Ranges Extractable TPHC Ranges

SAMPLE ID	SAMPLE DESCRIPTION	MATRIX	ANALYSIS PERFORMED
MC46523-8	S-32	Groundwater	Volatile TPHC Ranges Extractable TPHC Ranges
MC46523-9	RA-10S	Groundwater	Volatile TPHC Ranges Extractable TPHC Ranges
MC46523-9D	RA-10S MSD	Groundwater	Volatile TPHC Ranges Extractable TPHC Ranges
MC46523-9S	RA-10S MS	Groundwater	Volatile TPHC Ranges Extractable TPHC Ranges
MC46523-10	RA-10D	Groundwater	Volatile TPHC Ranges Extractable TPHC Ranges
MC46523-11	EB-061416	AQ- Equipment Blank	Volatile TPHC Ranges Extractable TPHC Ranges

Reviewer Name: Rafael Infante
Chemist License 1888

Signature:

Rafael Infante

Date:

July 17, 2016



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Client Sample ID:	MW-17	Date Sampled:	06/10/16
Lab Sample ID:	MC46523-1	Date Received:	06/22/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP VPH REV 1.1		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BH39424.D	1	06/23/16	DF	n/a	n/a	GBH2331
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	25	ug/l	
	C9- C12 Aliphatics (Unadj.)	174	50	25	ug/l	
	C9- C10 Aromatics (Unadj.)	102	50	25	ug/l	
	C5- C8 Aliphatics	ND	50	25	ug/l	
	C9- C12 Aliphatics	70.7	50	25	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	83%		70-130%
	2,3,4-Trifluorotoluene	86%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	MW-17	Date Sampled:	06/10/16
Lab Sample ID:	MC46523-1	Date Received:	06/22/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE14730.D	1	06/27/16	TA	06/22/16	OP47936	GDE818
Run #2							

Run #	Initial Volume	Final Volume
Run #1	920 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	172	110	31	ug/l	
	C9-C18 Aliphatics	78.1	110	18	ug/l	JB
	C19-C36 Aliphatics	60.1	110	29	ug/l	JB
	C11-C22 Aromatics	168	110	31	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	67%		40-140%
321-60-8	2-Fluorobiphenyl	79%		40-140%
3386-33-2	1-Chlorooctadecane	73%		40-140%
580-13-2	2-Bromonaphthalene	75%		40-140%



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Client Sample ID: MW-18
 Lab Sample ID: MC46523-2
 Matrix: AQ - Ground Water
 Method: MADEP VPH REV 1.1
 Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 06/10/16
 Date Received: 06/22/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BH39430.D	1	06/23/16	DF	n/a	n/a	GBH2331
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	34.7	50	25	ug/l	J
	C9- C12 Aliphatics (Unadj.)	197	50	25	ug/l	
	C9- C10 Aromatics (Unadj.)	128	50	25	ug/l	
	C5- C8 Aliphatics	34.5	50	25	ug/l	J
	C9- C12 Aliphatics	67.9	50	25	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	82%		70-130%
	2,3,4-Trifluorotoluene	85%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: MW-18
 Lab Sample ID: MC46523-2
 Matrix: AQ - Ground Water
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 06/10/16
 Date Received: 06/22/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE14731.D	1	06/27/16	TA	06/22/16	OP47936	GDE818
Run #2							

Run #	Initial Volume	Final Volume
Run #1	915 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	141	110	31	ug/l	
	C9-C18 Aliphatics	87.4	110	18	ug/l	JB
	C19-C36 Aliphatics	57.2	110	30	ug/l	JB
	C11-C22 Aromatics	136	110	31	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	73%		40-140%
321-60-8	2-Fluorobiphenyl	78%		40-140%
3386-33-2	1-Chlorooctadecane	77%		40-140%
580-13-2	2-Bromonaphthalene	65%		40-140%



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J = Indicates an estimated value
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Client Sample ID: MW-7
 Lab Sample ID: MC46523-3
 Matrix: AQ - Ground Water
 Method: MADEP VPH REV 1.1
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 06/10/16
 Date Received: 06/22/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BH39431.D	1	06/23/16	DF	n/a	n/a	GBH2331
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	25	ug/l	
	C9- C12 Aliphatics (Unadj.)	34.5	50	25	ug/l	J
	C9- C10 Aromatics (Unadj.)	ND	50	25	ug/l	
	C5- C8 Aliphatics	ND	50	25	ug/l	
	C9- C12 Aliphatics	ND	50	25	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	82%		70-130%
	2,3,4-Trifluorotoluene	84%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	MW-7	Date Sampled:	06/10/16
Lab Sample ID:	MC46523-3	Date Received:	06/22/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE14732.D	1	06/27/16	TA	06/22/16	OP47936	GDE818
Run #2							

Run #	Initial Volume	Final Volume
Run #1	960 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	42.4	100	30	ug/l	J
	C9-C18 Aliphatics	48.4	100	17	ug/l	JB
	C19-C36 Aliphatics	108	100	28	ug/l	B
	C11-C22 Aromatics	42.4	100	30	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	78%		40-140%
321-60-8	2-Fluorobiphenyl	83%		40-140%
3386-33-2	1-Chlorooctadecane	87%		40-140%
580-13-2	2-Bromonaphthalene	67%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
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J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	S-36	Date Sampled:	06/13/16
Lab Sample ID:	MC46523-4	Date Received:	06/22/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP VPH REV 1.1		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BH39432.D	1	06/23/16	DF	n/a	n/a	GBH2331
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	25	ug/l	
	C9- C12 Aliphatics (Unadj.)	ND	50	25	ug/l	
	C9- C10 Aromatics (Unadj.)	ND	50	25	ug/l	
	C5- C8 Aliphatics	ND	50	25	ug/l	
	C9- C12 Aliphatics	ND	50	25	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	78%		70-130%
	2,3,4-Trifluorotoluene	81%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	S-36	Date Sampled:	06/13/16
Lab Sample ID:	MC46523-4	Date Received:	06/22/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE14733.D	1	06/27/16	TA	06/22/16	OP47936	GDE818
Run #2							

	Initial Volume	Final Volume
Run #1	980 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	35.2	100	29	ug/l	J
	C9-C18 Aliphatics	25.8	100	17	ug/l	JB
	C19-C36 Aliphatics	49.3	100	28	ug/l	JB
	C11-C22 Aromatics	35.2	100	29	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	75%		40-140%
321-60-8	2-Fluorobiphenyl	89%		40-140%
3386-33-2	1-Chlorooctadecane	59%		40-140%
580-13-2	2-Bromonaphthalene	97%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	S-36D	Date Sampled:	06/13/16
Lab Sample ID:	MC46523-5	Date Received:	06/22/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP VPH REV 1.1		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BH39433.D	1	06/23/16	DF	n/a	n/a	GBH2331
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	25	ug/l	
	C9- C12 Aliphatics (Unadj.)	ND	50	25	ug/l	
	C9- C10 Aromatics (Unadj.)	ND	50	25	ug/l	
	C5- C8 Aliphatics	ND	50	25	ug/l	
	C9- C12 Aliphatics	ND	50	25	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	79%		70-130%
	2,3,4-Trifluorotoluene	82%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	S-36D	Date Sampled:	06/13/16
Lab Sample ID:	MC46523-5	Date Received:	06/22/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE14734.D	1	06/27/16	TA	06/22/16	OP47936	GDE818
Run #2							

Run #	Initial Volume	Final Volume
Run #1	970 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	31.2	100	30	ug/l	J
	C9-C18 Aliphatics	29.3	100	17	ug/l	JB
	C19-C36 Aliphatics	51.4	100	28	ug/l	JB
	C11-C22 Aromatics	31.2	100	30	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	52%		40-140%
321-60-8	2-Fluorobiphenyl	81%		40-140%
3386-33-2	1-Chlorooctadecane	54%		40-140%
580-13-2	2-Bromonaphthalene	88%		40-140%



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J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: S-37
 Lab Sample ID: MC46523-6
 Matrix: AQ - Ground Water
 Method: MADEP VPH REV 1.1
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 06/13/16
 Date Received: 06/22/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BH39434.D	1	06/23/16	DF	n/a	n/a	GBH2331
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	25	ug/l	
	C9- C12 Aliphatics (Unadj.)	ND	50	25	ug/l	
	C9- C10 Aromatics (Unadj.)	ND	50	25	ug/l	
	C5- C8 Aliphatics	ND	50	25	ug/l	
	C9- C12 Aliphatics	ND	50	25	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	82%		70-130%
	2,3,4-Trifluorotoluene	85%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	S-37	Date Sampled:	06/13/16
Lab Sample ID:	MC46523-6	Date Received:	06/22/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE14735.D	1	06/27/16	TA	06/22/16	OP47936	GDE818
Run #2							

Run #	Initial Volume	Final Volume
Run #1	980 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	ND	100	29	ug/l	
	C9-C18 Aliphatics	22.8	100	17	ug/l	JB
	C19-C36 Aliphatics	40.6	100	28	ug/l	JB
	C11-C22 Aromatics	ND	100	29	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	70%		40-140%
321-60-8	2-Fluorobiphenyl	83%		40-140%
3386-33-2	1-Chlorooctadecane	69%		40-140%
580-13-2	2-Bromonaphthalene	91%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID: S-35
 Lab Sample ID: MC46523-7
 Matrix: AQ - Ground Water
 Method: MADEP VPH REV 1.1
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 06/13/16
 Date Received: 06/22/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BH39435.D	1	06/23/16	DF	n/a	n/a	GBH2331
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	25	ug/l	
	C9- C12 Aliphatics (Unadj.)	ND	50	25	ug/l	
	C9- C10 Aromatics (Unadj.)	ND	50	25	ug/l	
	C5- C8 Aliphatics	ND	50	25	ug/l	
	C9- C12 Aliphatics	ND	50	25	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	79%		70-130%
	2,3,4-Trifluorotoluene	82%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	S-35	Date Sampled:	06/13/16
Lab Sample ID:	MC46523-7	Date Received:	06/22/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE14736.D	1	06/27/16	TA	06/22/16	OP47936	GDE818
Run #2							

Run #	Initial Volume	Final Volume
Run #1	895 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	ND	110	32	ug/l	
	C9-C18 Aliphatics	27.3	110	19	ug/l	JB
	C19-C36 Aliphatics	48.5	110	30	ug/l	JB
	C11-C22 Aromatics	ND	110	32	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	64%		40-140%
321-60-8	2-Fluorobiphenyl	77%		40-140%
3386-33-2	1-Chlorooctadecane	66%		40-140%
580-13-2	2-Bromonaphthalene	83%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

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Client Sample ID:	S-32	Date Sampled:	06/13/16
Lab Sample ID:	MC46523-8	Date Received:	06/22/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP VPH REV 1.1		
Project:	BMSMC, Building 5 Area, Puerto Rico		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BH39436.D	1	06/23/16	DF	n/a	n/a	GBH2331
Run #2	BH39446.D	100	06/24/16	DF	n/a	n/a	GBH2333

	Purge Volume
Run #1	5.0 ml
Run #2	5.0 ml

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	119	50	25	ug/l	
	C9- C12 Aliphatics (Unadj.)	108000 ^a	5000	2500	ug/l	
	C9- C10 Aromatics (Unadj.)	463	50	25	ug/l	
	C5- C8 Aliphatics	50.5	50	25	ug/l	
	C9- C12 Aliphatics	11200	50	25	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	119%	81%	70-130%
	2,3,4-Trifluorotoluene	124%	83%	70-130%

(a) Result is from Run# 2



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

SGS Accutest

Report of Analysis

Page 1 of 1

Client Sample ID:	S-32	Date Sampled:	06/13/16
Lab Sample ID:	MC46523-8	Date Received:	06/22/16
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE14738.D	1	06/27/16	TA	06/22/16	OP47936	GDE818
Run #2							

Run #	Initial Volume	Final Volume
Run #1	920 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	49.5	110	31	ug/l	J
	C9-C18 Aliphatics	185	110	18	ug/l	B
	C19-C36 Aliphatics	59.7	110	29	ug/l	JB
	C11-C22 Aromatics	49.5	110	31	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	80%		40-140%
321-60-8	2-Fluorobiphenyl	81%		40-140%
3386-33-2	1-Chlorooctadecane	83%		40-140%
580-13-2	2-Bromonaphthalene	60%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

SGS Accutest

Report of Analysis

Page 1 of 1

Client Sample ID: RA-10S
 Lab Sample ID: MC46523-9
 Matrix: AQ - Ground Water
 Method: MADEP VPH REV 1.1
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 06/14/16
 Date Received: 06/22/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BH39425.D	1	06/23/16	DF	n/a	n/a	GBH2332
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	36.2	50	25	ug/l	J
	C9- C12 Aliphatics (Unadj.)	ND	50	25	ug/l	
	C9- C10 Aromatics (Unadj.)	ND	50	25	ug/l	
	C5- C8 Aliphatics	31.1	50	25	ug/l	J
	C9- C12 Aliphatics	ND	50	25	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	83%		70-130%
	2,3,4-Trifluorotoluene	86%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

SGS Accutest

Report of Analysis

Page 1 of 1

Client Sample ID: RA-10S
 Lab Sample ID: MC46523-9
 Matrix: AQ - Ground Water
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BSMC, Building 5 Area, Puerto Rico

Date Sampled: 06/14/16
 Date Received: 06/22/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE14739.D	1	06/27/16	TA	06/22/16	OP47936	GDE818
Run #2							

Run #	Initial Volume	Final Volume
Run #1	970 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	ND	100	30	ug/l	
	C9-C18 Aliphatics	26.0	100	17	ug/l	JB
	C19-C36 Aliphatics	41.3	100	28	ug/l	JB
	C11-C22 Aromatics	ND	100	30	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	76%		40-140%
321-60-8	2-Fluorobiphenyl	85%		40-140%
3386-33-2	1-Chlorooctadecane	69%		40-140%
580-13-2	2-Bromonaphthalene	93%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

SGS Accutest

Report of Analysis

Page 1 of 1

Client Sample ID: RA-10D
 Lab Sample ID: MC46523-10
 Matrix: AQ - Ground Water
 Method: MADEP VPH REV 1.1
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 06/14/16
 Date Received: 06/22/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BH39445.D	1	06/24/16	DF	n/a	n/a	GBH2333
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	59.3	50	25	ug/l	
	C9- C12 Aliphatics (Unadj.)	108	50	25	ug/l	
	C9- C10 Aromatics (Unadj.)	61.2	50	25	ug/l	
	C5- C8 Aliphatics	53.4	50	25	ug/l	
	C9- C12 Aliphatics	46.4	50	25	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	83%		70-130%
	2,3,4-Trifluorotoluene	86%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

SGS Accutest

Report of Analysis

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Client Sample ID: RA-10D
 Lab Sample ID: MC46523-10
 Matrix: AQ - Ground Water
 Method: MADEP EPH REV 1.1 SW846 3510C
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 06/14/16
 Date Received: 06/22/16
 Percent Solids: n/a

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE14740.D	1	06/27/16	TA	06/22/16	OP47936	GDE818
Run #2							

Run #	Initial Volume	Final Volume
Run #1	900 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	57.9	110	32	ug/l	J
	C9-C18 Aliphatics	27.1	110	19	ug/l	JB
	C19-C36 Aliphatics	42.4	110	30	ug/l	JB
	C11-C22 Aromatics	57.4	110	32	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	68%		40-140%
321-60-8	2-Fluorobiphenyl	72%		40-140%
3386-33-2	1-Chlorooctadecane	74%		40-140%
580-13-2	2-Bromonaphthalene	79%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

SGS Accutest

Report of Analysis

Page 1 of 1

Client Sample ID: EB-061416
 Lab Sample ID: MC46523-11
 Matrix: AQ - Equipment Blank
 Method: MADEP VPH REV 1.1
 Project: BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 06/14/16
 Date Received: 06/22/16
 Percent Solids: n/a

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	BH39438.D	1	06/23/16	DF	n/a	n/a	GBH2331
Run #2							

	Purge Volume
Run #1	5.0 ml
Run #2	

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	25	ug/l	
	C9- C12 Aliphatics (Unadj.)	ND	50	25	ug/l	
	C9- C10 Aromatics (Unadj.)	ND	50	25	ug/l	
	C5- C8 Aliphatics	ND	50	25	ug/l	
	C9- C12 Aliphatics	ND	50	25	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	74%		70-130%
	2,3,4-Trifluorotoluene	78%		70-130%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

SGS Accutest

Report of Analysis

Page 1 of 1

Client Sample ID:	EB-061416	Date Sampled:	06/14/16
Lab Sample ID:	MC46523-11	Date Received:	06/22/16
Matrix:	AQ - Equipment Blank	Percent Solids:	n/a
Method:	MADEP EPH REV 1.1 SW846 3510C		
Project:	BMSMC, Building 5 Area, Puerto Rico		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE14741.D	1	06/27/16	TA	06/22/16	OP47936	GDE818
Run #2							

Run #	Initial Volume	Final Volume
Run #1	870 ml	2.0 ml
Run #2		

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	ND	110	33	ug/l	
	C9-C18 Aliphatics	24.7	110	19	ug/l	JB
	C19-C36 Aliphatics	38.9	110	31	ug/l	JB
	C11-C22 Aromatics	ND	110	33	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	64%		40-140%
321-60-8	2-Fluorobiphenyl	75%		40-140%
3386-33-2	1-Chlorooctadecane	67%		40-140%
580-13-2	2-Bromonaphthalene	82%		40-140%



ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Matrix Spike/Matrix Spike Duplicate Summary

Page 1 of 1

Job Number: MC46523

Account: AMANYWP Anderson Mulholland and Assoc.

Project: BMSMC, Building 5 Area, Puerto Rico

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC46523-1MS	BH39426.D	1	06/23/16	DF	n/a	n/a	GBH2331
MC46523-1MSD	BH39427.D	1	06/23/16	DF	n/a	n/a	GBH2331
MC46523-1	BH39424.D	1	06/23/16	DF	n/a	n/a	GBH2331

The QC reported here applies to the following samples:

Method: MADEP VPH REV 1.1

MC46523-1, MC46523-2, MC46523-3, MC46523-4, MC46523-5, MC46523-6, MC46523-7, MC46523-8, MC46523-11

CAS No.	Compound	MC46523-1 ug/l	Spike Q	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
	C5- C8 Aliphatics (Unadj.)	ND	300	295	99	300	291	97	1	70-130/25
	C9- C12 Aliphatics (Unadj.)	174	450	551	94	450	551	94	0	70-130/25
	C9- C10 Aromatics (Unadj.)	102	150	211	73	150	212	73	0	70-130/25

CAS No.	Surrogate Recoveries	MS	MSD	MC46523-1	Limits
	2,3,4-Trifluorotoluene	83%	82%	83%	70-130%
	2,3,4-Trifluorotoluene	87%	86%	86%	70-130%



* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Page 1 of 1

Job Number: MC46523

Account: AMANYWP Anderson Mulholland and Assoc.

Project: BMSMC, Building 5 Area, Puerto Rico

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
MC46523-9MS	BH39428.D	1	06/23/16	DF	n/a	n/a	GBH2332
MC46523-9MSD	BH39429.D	1	06/23/16	DF	n/a	n/a	GBH2332
MC46523-9	BH39425.D	1	06/23/16	DF	n/a	n/a	GBH2332

The QC reported here applies to the following samples:

Method: MADEP VPH REV 1.1

MC46523-9

CAS No.	Compound	MC46523-9 ug/l	Spike Q	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
	C5- C8 Aliphatics (Unadj.)	36.2	J	300	102	300	303	101	1	70-130/25
	C9- C12 Aliphatics (Unadj.)	ND		450	93	450	416	92	0	70-130/25
	C9- C10 Aromatics (Unadj.)	ND		150	86	150	130	87	1	70-130/25

CAS No.	Surrogate Recoveries	MS	MSD	MC46523-9	Limits
	2,3,4-Trifluorotoluene	82%	82%	83%	70-130%
	2,3,4-Trifluorotoluene	85%	84%	86%	70-130%



* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Page 1 of 1

Job Number: MC46523

Account: AMANYWP Anderson Mulholland and Assoc.

Project: BSMC, Building 5 Area, Puerto Rico

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP47936-MS	DE14742.D	1	06/27/16	TA	06/22/16	OP47936	GDE818
OP47936-MSD	DE14743.D	1	06/27/16	TA	06/22/16	OP47936	GDE818
MC46523-1	DE14730.D	1	06/27/16	TA	06/22/16	OP47936	GDE818

The QC reported here applies to the following samples:

Method: MADEP EPH REV 1.1

MC46523-1, MC46523-2, MC46523-3, MC46523-4, MC46523-5, MC46523-6, MC46523-7, MC46523-8, MC46523-10, MC46523-11

CAS No.	Compound	MC46523-1 ug/l	Spike Q	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
	C11-C22 Aromatics (Unadj.)	172	879	760	67	816	793	76	4	40-140/25
	C9-C18 Aliphatics	78.1	JB 330	243	50	306	244	54	0	40-140/25
	C19-C36 Aliphatics	60.1	JB 440	392	76	408	382	79	3	40-140/25

CAS No.	Surrogate Recoveries	MS	MSD	MC46523-1	Limits
84-15-1	o-Terphenyl	59%	72%	67%	40-140%
321-60-8	2-Fluorobiphenyl	70%	79%	79%	40-140%
3386-33-2	1-Chlorooctadecane	60%	67%	73%	40-140%
580-13-2	2-Bromonaphthalene	74%	85%	75%	40-140%



* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Page 1 of 1

Job Number: MC46523

Account: AMANYWP Anderson Mulholland and Assoc.

Project: BSMC, Building 5 Area, Puerto Rico

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP47936-MS1	DE14744.D	1	06/27/16	TA	06/22/16	OP47936	GDE818
OP47936-MSD1	DE14745.D	1	06/28/16	TA	06/22/16	OP47936	GDE818
MC46523-9	DE14739.D	1	06/27/16	TA	06/22/16	OP47936	GDE818

The QC reported here applies to the following samples:

Method: MADEP EPH REV 1.1

MC46523-9

CAS No.	Compound	MC46523-9 ug/l	Spike Q	ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
	C11-C22 Aromatics (Unadj.)	ND		812	584	72	842	670	80	14	40-140/25
	C9-C18 Aliphatics	26.0	JB	305	212	61	316	225	63	6	40-140/25
	C19-C36 Aliphatics	41.3	JB	406	359	78	421	369	78	3	40-140/25

CAS No.	Surrogate Recoveries	MS	MSD	MC46523-9	Limits
84-15-1	o-Terphenyl	63%	71%	76%	40-140%
321-60-8	2-Fluorobiphenyl	74%	84%	85%	40-140%
3386-33-2	1-Chlorooctadecane	58%	73%	69%	40-140%
580-13-2	2-Bromonaphthalene	74%	68%	93%	40-140%



* = Outside of Control Limits.

CHAIN OF CUSTODY

Fresh Ponds Corporate Village, Building B
2235 Route 130, Dayton, NJ 08810
732-329-0200 FAX: 732-329-3499/3480

FE04 H17L
RUEAS15P60

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Accutest Job #: J122206
Accutest Quote #: 11246523

Client Information				Facility Information				Analytical Information															
Anderson Mulholland & Associates				Anderson Mulholland																			
Name 2700 Westchester Avenue				Project Name																			
Address Purchase NY 10577				Location																			
City State Zip Terry Taylor				Project/PO #: 2Q16 Ground Water Sampling																			
Send Report to: Phone #: 914-251-0400				FAX #: 914-251-1288																			
Field ID / Point of Collection		Collection		Sampled By		Matrix		# of bottles		Preservation													
Field ID / Point of Collection	Date	Time	Sampled By	Matrix	# of bottles	Preservation	VOCs, 8260C	SVOCS, 8270D	OWA, 8170D	Pesticides, 8081B	VMAVPH	BMAEPR	1,4 Dioxane and naphthalene, Method 8260-OWA										
S-32-9-10	6/13/16	1808	NMR	GW	X	X	X	X	X	X	X	X	X	8									
RA-10S-9-10	6/14/16	1300	NMR	GW	X	X	X	X	X	X	X	X	X	9									
RA-10S MS	6/14/16	1325	NMR	GW	X	X	X	X	X	X	X	X	X										
RA-10S MSD	6/14/16	1349	NMR	GW	X	X	X	X	X	X	X	X	X										
RA-10D-10-17	6/14/16	1604	NMR	GW	X	X	X	X	X	X	X	X	X	10									
				GW	X	X	X	X	X	X	X	X	X										
				GW	X	X	X	X	X	X	X	X	X										
				GW	X	X	X	X	X	X	X	X	X										
EB-061416-17	6/14/16	1020	JD	EB	14	X	X	X	X	X	X	X	X	11									
TB-061416	6/14/16	1604	TB	TB	2	X	X	X	X	X	X	X	X	12									
Turnaround Information				Data Deliverable Information				Comments / Remarks															
<input checked="" type="checkbox"/> 21 Day Standard <input type="checkbox"/> 14 Day <input type="checkbox"/> 7 Days EMERGENCY <input type="checkbox"/> Other (Days) RUSH TAT is for FAX data unless previously approved.				Approved By: _____ <input type="checkbox"/> NJ Reduced <input checked="" type="checkbox"/> NJ Full <input type="checkbox"/> FULL CLP <input type="checkbox"/> Data Deliverable <input type="checkbox"/> Other (Specify)				<input type="checkbox"/> Commercial "A" <input type="checkbox"/> Commercial "B" <input type="checkbox"/> ASP Category 5 <input type="checkbox"/> State Forms				Federal Express ID # _____ Lab Trip Blank Date 6/14/16 Time 0630 For VOCs (8260C) add to report: Tetrahydrofuran, p-isopropyl toluene, 1-2-4 Trimethyl benzene, Benzyl chloride and Tert amylchloride. For SVOCS (8270D) add to report: 1-methyl naphthalene											
Sample Custody must be documented below each time samples change possession, including courier delivery.																							
Received by:		Date/Time:		Received by:		Date/Time:		Received by:		Date/Time:		Received by:		Date/Time:									
M. A. K...		6/14/16 1800		Fed Ex		6-15-16 925		Fed Ex		6-15-16 925		Fed Ex		6-15-16 925									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430									
M. A. K...		6/21/16 17:00		Fed Ex		6-22-16 430		Fed Ex		6-22-16 430		Fed Ex											

EXECUTIVE NARRATIVE

SDG No: **MC46523** Laboratory: **Accutest, Massachusetts**
Analysis: **MADEP VPH** Number of Samples: **15**
Location: **BMSMC, Building 5 Area**
Humacao, PR

SUMMARY: Fifteen (15) samples were analyzed for Volatiles TPHC Ranges by method MADEP VPH. Samples were validated following the METHOD FOR THE DETERMINATION OF VOLATILE PETROLEUM HYDROCARBONS (VPH) quality control criteria, Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

Results are valid and can be used for decision making purposes.

Critical issues: **None**
Major: **None**
Minor: **None**

Critical findings: **None**
Major findings: **None**
Minor findings: 1. % differences in the rt5.5-7 hydrocarbon range outside method and validation guidance document criteria for the continuing calibration verification. Results for VPH in the rt5.5-7 hydrocarbon range qualified estimated (J) or (UJ) in affected samples.

COMMENTS: Results are valid and can be used for decision making purposes.

Reviewers Name: **Rafael Infante**
Chemist License 1888

Signature:

A handwritten signature in blue ink, appearing to read 'Rafael Infante', is written over a horizontal line.

Date: **July 17, 2016**

SAMPLE ORGANIC DATA SAMPLE SUMMARY

Sample ID: MC46523-1
Sample location: BMSMC Building 5 Area
Sampling date: 6/10/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics (Unadj.)	174	ug/L	1	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	102	ug/L	1	-	-	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics	70.7	ug/L	1	-	-	Yes

Sample ID: MC46523-2
Sample location: BMSMC Building 5 Area
Sampling date: 6/10/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	34.7	ug/L	1	J	UJ	Yes
Ç9 - C12 Aliphatics (Unadj.)	197	ug/L	1	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	128	ug/L	1	-	-	Yes
Ç5 - C8 Aliphatics	34.7	ug/L	1	J	UJ	Yes
Ç9 - C12 Aliphatics	67.9	ug/L	1	-	-	Yes

Sample ID: MC46523-3
Sample location: BMSMC Building 5 Area
Sampling date: 6/10/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics (Unadj.)	34.5	ug/L	1	J	UJ	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC46523-4
Sample location: BMSMC Building 5 Area
Sampling date: 6/13/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC46523-5
Sample location: BMSMC Building 5 Area
Sampling date: 6/13/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC46523-6
Sample location: BMSMC Building 5 Area
Sampling date: 6/13/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC46523-7
Sample location: BMSMC Building 5 Area
Sampling date: 6/13/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC46523-8
Sample location: BMSMC Building 5 Area
Sampling date: 6/13/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	119	ug/L	1	-	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	108000	ug/L	100	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	463	ug/L	1	-	-	Yes
Ç5 - C8 Aliphatics	50.5	ug/L	1	-	J	Yes
Ç9 - C12 Aliphatics	11200	ug/L	1	-	-	Yes

Sample ID: MC46523-9
Sample location: BMSMC Building 5 Area
Sampling date: 6/14/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	36.2	ug/L	1	J	UJ	Yes
Ç9 - C12 Aliphatics (Unadj.)	50	ug/L	1	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1	-	-	Yes
Ç5 - C8 Aliphatics	31.1	ug/L	1	J	UJ	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	-	Yes

Sample ID: MC46523-10
Sample location: BMSMC Building 5 Area
Sampling date: 6/14/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	59.3	ug/L	1	-	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	108	ug/L	1	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	61.2	ug/L	1	-	-	Yes
Ç5 - C8 Aliphatics	53.4	ug/L	1	-	J	Yes
Ç9 - C12 Aliphatics	46.4	ug/L	1	J	UJ	Yes

Sample ID: MC46523-11
Sample location: BMSMC Building 5 Area
Sampling date: 6/14/2016
Matrix: AQ - Equipment Blank

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC46523-1MS
Sample location: BMSMC Building 5 Area
Sampling date: 6/10/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	295	ug/L	1	-	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	551	ug/L	1	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	211	ug/L	1	-	-	Yes

Sample ID: MC46523-1MSD
Sample location: BMSMC Building 5 Area
Sampling date: 6/10/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	291	ug/L	1	-	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	551	ug/L	1	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	212	ug/L	1	-	-	Yes

Sample ID: MC46523-9MS
Sample location: BMSMC Building 5 Area
Sampling date: 6/14/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	306	ug/L	1	-	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	417	ug/L	1	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	129	ug/L	1	-	-	Yes

Sample ID: MC46523-9MSD
Sample location: BMSMC Building 5 Area
Sampling date: 6/14/2016
Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	303	ug/L	1	-	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	416	ug/L	1	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	130	ug/L	1	-	-	Yes

DATA REVIEW WORKSHEETS

Type of validation Full: ☒ Limited: ☐ Project Number: MC46523 Date: 06/10-14/2016 Shipping date: 06/14/2016 EPA Region: 2

REVIEW OF VOLATILE PETROLEUM HYDROCARBON (VPHs) PACKAGE

The following guidelines for evaluating volatile organics were created to delineate required validation actions. This document will assist the reviewer in using professional judgment to make more informed decision and in better serving the needs of the data users. The sample results were assessed according to the data validation guidance documents in the following order of precedence METHOD FOR THE DETERMINATION OF VOLATILE PETROLEUM HYDROCARBONS (VPH), Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

The hardcopied (laboratory name) Accutest Laboratories data package received has been reviewed and the quality control and performance data summarized. The data review for SVOCs included:

Lab. Project/SDG No.: MC46523 Sample matrix: Groundwater
No. of Samples: 15
Field blank No.: -
Equipment blank No.: MC46523-11
Trip blank No.: -
Field duplicate No.: MC46523-4/MC46523-5

<input checked="" type="checkbox"/> Data Completeness	<input checked="" type="checkbox"/> Laboratory Control Spikes
<input checked="" type="checkbox"/> Holding Times	<input checked="" type="checkbox"/> Field Duplicates
<input type="checkbox"/> GC/MS Tuning	<input checked="" type="checkbox"/> Calibrations
<input type="checkbox"/> Internal Standard Performance	<input checked="" type="checkbox"/> Compound Identifications
<input checked="" type="checkbox"/> Blanks	<input checked="" type="checkbox"/> Compound Quantitation
<input checked="" type="checkbox"/> Surrogate Recoveries	<input checked="" type="checkbox"/> Quantitation Limits
<input checked="" type="checkbox"/> Matrix Spike/Matrix Spike Duplicate	

Overall Comments: Volatiles by GC by Method MADEP_VPH_REV_1.1 (C5_to_C12_Aliphatics; C9_to_C10_Aromatics)

Definition of Qualifiers:

J- Estimated results
U- Compound not detected
R- Rejected data
UJ- Estimated nondefect

Reviewer: Rafael Infante
Date: 07/17/2016

DATA REVIEW WORKSHEETS

All criteria were met x
Criteria were not met and/or see below

I. DATA COMPLETNESS

A. Data Package:

MISSING INFORMATION

DATE LAB. CONTACTED

DATE RECEIVED

[illegible]

B. Other

Discrepancies:

[illegible]

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

HOLDING TIMES

The objective of this parameter is to ascertain the validity of the results based on the holding time of the sample from time of collection to the time of extraction, and subsequently from the time of extraction to the time of analysis.

Complete table for all samples and note the analysis and/or preservation not within criteria

SAMPLE ID	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	ACTION
Samples analyzed within method recommended holding time				

Criteria

Preservation:

Samples analyzed with ambient purge temperature: Samples must be acidified to a pH of 2.0 or less at the time of collection.

Samples analyzed with heated purge temperature: Samples must be treated to a pH of 11.0 or greater at the time of collection.

Methanol preservation of soil/sediment samples is mandatory. Methanol (purge-and-trap grade) must be added to the sample vial before or immediately after sample collection. In lieu of the in-field preservation of samples with methanol, soil samples may be obtained in specially-designed air tight sampling devices, provided that the samples are extruded and preserved in methanol within 48 hours of collection.

Holding times:

Aqueous samples using ambient or heated purge - analyze within 14 days.

Soil/sediment samples - analysis within 28 days.

Cooler temperature (Criteria: 4 ± 2 °C): 1.5°C

Actions: Qualify positive results/non-detects as follows:

If holding times are exceeded, estimate positive results (J) and nondetects (UJ).

If holding times are grossly exceeded, use professional judgment to qualify data. The data reviewer may choose to estimate positive results (J) and rejects nondetects (R).

If samples were not at the proper temperature ($> 10^{\circ}\text{C}$) or improperly preserved, use professional judgment to qualify the results.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration: 06/09/16

Dates of initial calibration verification: 06/09/16

Instrument ID numbers: GCBH

Matrix/Level: AQUEOUS/MEDIUM

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
Initial and initial calibration verification meet method specific requirements				

Criteria- ICAL

- Five point calibration curve.
- The percent relative standard deviation (%RSD) of the calibration factor must be equal to or less than 25% over the working range for the analyte of interest. When this condition is met, linearity through the origin may be assumed, and the average calibration factor is used in lieu of a calibration curve.
- A collective calibration factor must also be established for each hydrocarbon range of interest. Calculate the collective CFs for C5-C8 Aliphatic Hydrocarbons and C9-C12 Aliphatic Hydrocarbons using the FID chromatogram. Calculate the collective CF for the C9-C10 Aromatic Hydrocarbons using the PID chromatogram. Tabulate the summation of the peak areas of all components in that fraction against the total concentration injected. The %RSD of the calibration factor must be equal to or less than 25% over the working range for the hydrocarbon range of interest.

Criteria- CCAL

- At a minimum, the working calibration factor must be verified on each working day, after every 20 samples, and at the end of the analytical sequence by the injection of a mid-level continuing calibration standard to verify instrument performance and linearity.
- If the percent difference (%D) for any analyte varies from the predicted response by more than $\pm 25\%$, a new five-point calibration must be performed for that analyte. Greater percent differences are permissible for n-nonane. If the %D for n-nonane is greater than 30, note the nonconformance in the case narrative. It

DATA REVIEW WORKSHEETS

should be noted that the %Ds are calculated when CFs are used for the initial calibration and percent drifts are calculated when calibration curves using linear regression are used for the initial calibration.

Actions:

If %RSD > 25% for target compounds or a correlation coefficient < 0.99, estimate positive results (J) and use professional judgment to qualify nondetects.

If % D > 25% (> 30 for nonane), estimate positive results (J) and nondetects (UJ).

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration: _____ 06/09/16 _____

Dates of continuing calibration verification: _06/23/16;_06/24/16__

Dates of final calibration verification: _____ 06/23/16;_06/24/16__

Instrument ID numbers: _____ GCBH _____

Matrix/Level: _____ AQUEOUS/MEDIUM _____

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
GCBH				
06/23/16	cc2318-50	rt5.5-7	28.3 %	MC46523-1 to -11; -1MS/-1MSD; -9MS/-9MSD
06/23/16	cc2318-50	rt5.5-7	29.1 %	
06/24/16	cc2318-50	rt5.5-7	28.4 %	MC46523-10; -8
06/24/16	cc2318-50	rt5.5-7	29.5 %	

Note: Results for VPH in the rt5.5-7 hydrocarbon range qualified estimated (J) or (UJ) in affected samples.

A separate worksheet should be filled for each initial curve

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

V A. BLANK ANALYSIS RESULTS (Sections 1 & 2)

The assessment of the blank analysis results is to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks apply only to blanks associated with the samples, including trip, equipment, and laboratory blanks. If problems with any blanks exist, all data associated with the case must be carefully evaluated to determine whether or not there is an inherent variability in the data for the case, or if the problem is an isolated occurrence not affecting other data. A Laboratory Method Blank must be run after samples suspected of being highly contaminated to determine if sample carryover has occurred.

List the contamination in the blanks below. High and low levels blanks must be treated separately.

Laboratory blanks

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS
---------------	--------	---------------	----------	---------------------

 METHOD BLANKS MEET THE METHOD SPECIFIC CRITERIA

Field/Trip/Equipment

A methanol trip blank or acidified reagent water trip blank should continually accompany each soil/sediment sample or water sample batch, respectively, during sampling, storage, and analysis.

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS
---------------	--------	---------------	----------	---------------------

 NO TARGET ANALYTES DETECTED IN THE EQUIPMENT BLANK. NO

 TRIP/FIELD BLANKS ASSOCIATED WITH THIS DATA PACKAGE.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

V B. BLANK ANALYSIS RESULTS (Section 3)

Blank Actions

The ALs for samples which have been diluted should be corrected for the sample dilution factor and/or % moisture, where applicable. Peaks must not be detected above the Reporting Limit within the retention time window of any analyte of interest. The hydrocarbon ranges must not be detected at a concentration greater than 10% of the most stringent MCP cleanup standard. Specific actions area as follows:

If the concentration is < sample quantitation limit (SQL) and < AL, report the compound as not detected (U) at the SQL.

If the concentration is \geq SQL but < AL, report the compound as not detected (U) at the reported concentration.

If the concentration is > AL, report the concentration unqualified.

DATA REVIEW WORKSHEETS

All criteria were met X
 Criteria were not met and/or see below

SURROGATE SPIKE RECOVERIES

Laboratory performance of individual samples is established by evaluation of surrogate spike recoveries. All samples are spiked with surrogate compounds prior to sample analysis. The accuracy of the analysis is measured by the surrogate percent recovery. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the validation of data is frequently subjective and demands analytical experience and professional judgment.

List the percent recoveries (%Rs) which do not meet the criteria for surrogate recovery.

Matrix: solid/aqueous

SAMPLE ID	SURROGATE COMPOUND	ACTION
	2,3,4-Trifluorotoluene	
<u> SURROGATE_STANDARD_RECOVERIES_WITHIN_LABORATORY_CONTROL </u>		
<u> LIMITS </u>		

QC Limits* (Aqueous)

 LL to UL 70 to 130 to to

QC Limits* (Solid)

 LL to UL to to to

It is recommended that surrogate standard recoveries be monitored and documented on a continuing basis. At a minimum, when surrogate recovery from a sample, blank, or QC sample is less than 70% or more than 130%, check calculations to locate possible errors, check the fortifying standard solution for degradation, and check changes in instrument performance.

If the cause cannot be determined, reanalyze the sample unless one of the following exceptions applies:

- (1) Obvious interference is present on the chromatogram (e.g., unresolved complex mixture);
- (2) Percent moisture of associated soil/sediment sample is >25% and surrogate recovery is >10%; or
- (3) The surrogate exhibits high recovery and associated target analytes or hydrocarbon ranges are not detected in sample.

If a sample with a surrogate recovery outside of the acceptable range is not reanalyzed based on any of these aforementioned exceptions, this information must be noted on the data report form and discussed in the Executive Report. Analysis of the sample on dilution may diminish matrix-related surrogate recovery problems. This approach can be used as long as the reporting limits to evaluate applicable MCP standards can still be achieved with the dilution. If not, reanalysis without dilution must be performed.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

VII. A MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. This data alone cannot be used to evaluate the precision and accuracy of individual samples.

At the request of the data user, and in consideration of sample matrices and data quality objectives, matrix spikes and matrix duplicates may be analyzed with every batch of 20 samples or less per matrix.

- **Matrix duplicate** - Matrix duplicates are prepared by analyzing one sample in duplicate. The purpose of the matrix duplicates is to determine the homogeneity of the sample matrix as well as analytical precision. The RPD of detected results in the matrix duplicate samples must not exceed 50 when the results are greater than 5x the reporting limit.
- The desired spiking level is 50% of the highest calibration standard. However, the total concentration in the MS (including the MS and native concentration in the unspiked sample) should not exceed 75% of the highest calibration standard in order for a proper evaluation to be performed. The purpose of the matrix spike is to determine whether the sample matrix contributes bias to the analytical results. The corrected concentrations of each analyte within the matrix spiking solution must be within 70 - 130% of the true value. Lower recoveries of n-nonane are permissible (if included in the calibration of the C9-C12 aliphatic range), but must be noted in the narrative if <30%.

MS/MSD Recoveries and Precision Criteria

Sample ID: MC46523-1_MS/MSD Matrix/Level: Groundwater
Sample ID: MC46523-9_MS/MSD Matrix/Level: Groundwater

List the %Rs, RPD of the compounds which do not meet the QC criteria.

MS OR MSD	COMPOUND	% R	RPD	QC LIMITS	ACTION

Note: MS/MSD % recoveries and RPD within laboratory control limits.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

No action is taken on MS/MSD results alone to qualify the entire case. However, used informed professional judgment, the data reviewer may use the MS/MSD results in conjunction with other QC criteria and determine the need for some qualification of the data. In those instances where it can be determined that the results of the MS/MSD affect only the sample spiked, the qualification should be limited to this sample alone. However, it may be determined through the MS/MSD results that the laboratory is having a systematic problem in the analysis of one or more analytes, which affects the associated samples.

2. MS/MSD – Unspiked Compounds

List the concentrations of the unspiked compounds and determine the % RSDs of these compounds in the unspiked sample, matrix spike, and matrix spike duplicate.

COMPOUND	CONCENTRATION		MSD	%RPD	ACTION
	SAMPLE	MS			

Criteria: None specified, use %RSD \leq 50 as professional judgment.

Actions:

if the % RSD > 50, qualify the results in the spiked sample as estimate (J).

If the % RSD is not calculable (NC) due to nondetect value in the sample, MS, and/or MSD, use professional judgment to qualify sample data.

A separate worksheet should be used for each MS/MSD pair.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

VIII. LABORATORY CONTROL SAMPLE (LCS/LCSD) ANALYSIS

This data is generated to determine accuracy of the analytical method for various matrices.

1. LCS Recoveries Criteria

List the %R of compounds which do not meet the criteria

LCS ID	COMPOUND	% R	QC LIMIT	ACTION
<u> LCS_RECOVERY_WITHIN_LABORATORY_CONTROL_LIMITS </u>				

Criteria:

- * Refer to QAPP for specific criteria.
- * The spike recovery must be between 70% and 130%. Lower recoveries of n-nonane are permissible (if included in the calibration of the C9-C12 aliphatic range). If the recovery of n-nonane is <30%, note the nonconformance in the executive narrative.

Actions:

Actions on LCS recovery should be based on both the number of compounds that are outside the %R criteria and the magnitude of the exceedance of the criteria.

If the %R of the analyte is > UL, qualify all positive results (j) for the affected analyte in the associated samples and accept nondetects.

If the %R of the analyte is < LL, qualify all positive results (j) and reject (R) nondetects for the affected analyte in the associated samples.

If more than half the compounds in the LCS are not within the required recovery criteria, qualify all positive results as (J) and reject nondetects (R) for all target analyte(s) in the associated samples.

2. Frequency Criteria:

Where LCS analyzed at the required frequency and for each matrix (1 per 20 samples per matrix)? Yes or No.

If no, the data may be affected. Use professional judgment to determine the severity of the effect and qualify data accordingly. Discuss any actions below and list the samples affected. Discuss the actions below:

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

IX. FIELD/LABORATORY DUPLICATE PRECISION

Sample IDs: MC46523-4/MC46523-5

Matrix: Groundwater

Field/laboratory duplicates samples may be taken and analyzed as an indication of overall precision. These analyses measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates which measures only laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.

COMPOUND	SQL	SAMPLE CONC.	DUPLICATE CONC.	RPD	ACTION
Field duplicate analyzed with this data package. RPD within laboratory and validation guidance document criteria (+ 50 %) for analytes detected above reporting limits.					

Criteria:

The project QAPP should be reviewed for project-specific information.
RPD \pm 30% for aqueous samples, RPD \pm 50 % for solid samples if results are \geq SQL.
If both samples and duplicate are < 5 SQL, the RPD criteria is doubled.

SQL = soil quantitation limit

Actions:

If both the sample and the duplicate results are nondetects (ND), the RPD is not calculable (NC). No action is needed.

Qualify as estimated positive results (J) and nondetects (UJ) for the compound that exceeded the above criteria.

If one sample result is not detected and the other is ≥ 5 x the SQL qualify (J/UJ).

Note: If SQLs for the sample and duplicate are significantly different, use professional judgment to determine if qualification is appropriate.

If one sample value is not detected and the other is < 5 x the SQL, use professional judgment to determine if qualification is appropriate.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

XI. COMPOUND IDENTIFICATION

The compound identification evaluation is to verify that the laboratory correctly identified target analytes as well as tentatively identified compounds (TICs).

1. Verify that the target analytes were within the retention time windows.
 - Retention time windows must be re-established for each Target VPH Analyte each time a new GC column is installed, and must be verified and/or adjusted on a daily basis.
 - Coelution of the m- and p- xylene isomers is permissible.
 - All surrogates must be adequately resolved from individual Target Analytes included in the VPH Component Standard.
 - For the purposes of this method, adequate resolution is assumed to be achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks.
 - The n-pentane (C5) and MtBE peaks must be adequately resolved from any solvent front that may be present on the FID and PID chromatograms, respectively.

Note: Target analytes were within the retention time window.

2. If target analytes and/or TICs were not correctly identified, request that the laboratory resubmit the corrected data.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

XII. QUANTITATION LIMITS AND SAMPLE RESULTS

The sample quantitation evaluation is to verify laboratory quantitation results.

1. In the space below, please show a minimum of one sample calculation:

MC46523-8 VPH (C5 – C7 Aliphatics) RF = 9.463×10^5

FID

$$[] = (1429913) / (9.463 \times 10^5)$$

$$[] = 1.51 \text{ ppb} \quad \text{Ok}$$

MC46523-8 VPH (C9 – C10 Aromatics) RF = 0.917×10^6

PID

$$[] = (6096692) / (0.917 \times 10^6)$$

$$[] = 6.65 \text{ ppb} \quad \text{Ok}$$

2. If requested, verify that the results were above the laboratory method detection limit (MDLs).
3. If dilutions performed, were the SQLs elevated accordingly by the laboratory? List the affected samples and dilution factor in the table below.

SAMPLE ID	DILUTION FACTOR	REASON FOR DILUTION
MC46523-8	100 X	Analytes over calibration range

If dilution was not performed and the results were above the concentration range, estimate results (J) for the affected compounds. List the affected samples/compounds:

EXECUTIVE NARRATIVE

SDG No: **MC46523** Laboratory: **Accutest, Massachusetts**
Analysis: **MADEP EPH** Number of Samples: **15**
Location: **BMSMC, Building 5 Area**
Humacao, PR

SUMMARY: Fifteen (15) samples were analyzed for Extractable Petroleum Hydrocarbons TPHC Ranges by method MADEP EPH. Samples were validated following the METHOD FOR THE DETERMINATION OF EXTRACTABLE PETROLEUM HYDROCARBONS (EPH) quality control criteria, Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

Results are valid and can be used for decision making purposes.

Critical issues: **None**
Major: **None**
Minor: **None**

Critical findings: **None**
Major findings: **None**
Minor findings: 1. Analytes detected in method blank. No action taken, blank concentration below the reporting limit. The laboratory qualified the results with a B qualifier. No further qualification required.

COMMENTS: Results are valid and can be used for decision making purposes.

Reviewers Name: **Rafael Infante**
Chemist License 1888

Signature:



Date:

July 17, 2016

SAMPLE ORGANIC DATA SAMPLE SUMMARY

Sample ID: MC46523-1
Sample location: BMSMC Building 5 Area
Sampling date: 6/10/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	172	ug/L	1	-	-	Yes
Ç9 - C18 Aliphatics	78.1	ug/L	1	JB	UJ	Yes
Ç19 - C36 Aliphatics	60.1	ug/L	1	JB	UJ	Yes
Ç11 - C22 Aromatics	168	ug/L	1	-	-	Yes

Sample ID: MC46523-2
Sample location: BMSMC Building 5 Area
Sampling date: 6/10/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	171	ug/L	1	-	-	Yes
Ç9 - C18 Aliphatics	87.4	ug/L	1	JB	UJ	Yes
Ç19 - C36 Aliphatics	57.2	ug/L	1	JB	UJ	Yes
Ç11 - C22 Aromatics	136	ug/L	1	-	-	Yes

Sample ID: MC46523-3
Sample location: BMSMC Building 5 Area
Sampling date: 6/10/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	42.4	ug/L	1	J	UJ	Yes
Ç9 - C18 Aliphatics	48.4	ug/L	1	JB	UJ	Yes
Ç19 - C36 Aliphatics	108	ug/L	1	B	-	Yes
Ç11 - C22 Aromatics	42.4	ug/L	1	J	UJ	Yes

Sample ID: MC46523-4
Sample location: BMSMC Building 5 Area
Sampling date: 6/13/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	35.2	ug/L	1	J	UJ	Yes
Ç9 - C18 Aliphatics	25.8	ug/L	1	JB	UJ	Yes
Ç19 - C36 Aliphatics	49.3	ug/L	1	JB	UJ	Yes
Ç11 - C22 Aromatics	35.2	ug/L	1	J	UJ	Yes

Sample ID: MC46523-5
Sample location: BMSMC Building 5 Area
Sampling date: 6/13/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	31.2	ug/L	1	J	UJ	Yes
Ç9 - C18 Aliphatics	29.3	ug/L	1	JB	UJ	Yes
Ç19 - C36 Aliphatics	51.4	ug/L	1	JB	UJ	Yes
Ç11 - C22 Aromatics	31.2	ug/L	1	J	UJ	Yes

Sample ID: MC46523-6
Sample location: BMSMC Building 5 Area
Sampling date: 6/13/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	100	ug/L	1	-	U	Yes
Ç9 - C18 Aliphatics	22.8	ug/L	1	JB	UJ	Yes
Ç19 - C36 Aliphatics	40.6	ug/L	1	JB	UJ	Yes
Ç11 - C22 Aromatics	100	ug/L	1	-	U	Yes

Sample ID: MC46523-7
Sample location: BMSMC Building 5 Area
Sampling date: 6/13/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	-	U	Yes
Ç9 - C18 Aliphatics	27.3	ug/L	1	JB	UJ	Yes
Ç19 - C36 Aliphatics	48.5	ug/L	1	JB	UJ	Yes
Ç11 - C22 Aromatics	110	ug/L	1	-	U	Yes

Sample ID: MC46523-8
Sample location: BMSMC Building 5 Area
Sampling date: 6/13/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	49.5	ug/L	1	J	UJ	Yes
Ç9 - C18 Aliphatics	185	ug/L	1	B	-	Yes
Ç19 - C36 Aliphatics	59.7	ug/L	1	JB	UJ	Yes
Ç11 - C22 Aromatics	49.5	ug/L	1	J	UJ	Yes

Sample ID: MC46523-9
Sample location: BMSMC Building 5 Area
Sampling date: 6/14/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	-	U	Yes
Ç9 - C18 Aliphatics	26	ug/L	1	JB	UJ	Yes
Ç19 - C36 Aliphatics	41.3	ug/L	1	JB	UJ	Yes
Ç11 - C22 Aromatics	110	ug/L	1	-	U	Yes

Sample ID: MC46523-10
Sample location: BMSMC Building 5 Area
Sampling date: 6/14/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	57.9	ug/L	1	J	UJ	Yes
Ç9 - C18 Aliphatics	27.1	ug/L	1	JB	UJ	Yes
Ç19 - C36 Aliphatics	42.4	ug/L	1	JB	UJ	Yes
Ç11 - C22 Aromatics	57.4	ug/L	1	J	UJ	Yes

Sample ID: MC46523-11
Sample location: BMSMC Building 5 Area
Sampling date: 6/14/2016
Matrix: AQ - Equipment Blank

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	-	U	Yes
Ç9 - C18 Aliphatics	24.7	ug/L	1	JB	UJ	Yes
Ç19 - C36 Aliphatics	38.9	ug/L	1	JB	UJ	Yes
Ç11 - C22 Aromatics	110	ug/L	1	-	U	Yes

Sample ID: MC46523-1MS
Sample location: BMSMC Building 5 Area
Sampling date: 6/10/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	760	ug/L	1	-	-	Yes
Ç9 - C18 Aliphatics	243	ug/L	1	-	-	Yes
Ç19 - C36 Aliphatics	392	ug/L	1	-	-	Yes

Sample ID: MC46523-1MSD
Sample location: BMSMC Building 5 Area
Sampling date: 6/10/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	793	ug/L	1	-	-	Yes
Ç9 - C18 Aliphatics	244	ug/L	1	-	-	Yes
Ç19 - C36 Aliphatics	382	ug/L	1	-	-	Yes

Sample ID: MC46523-9MS
Sample location: BMSMC Building 5 Area
Sampling date: 6/14/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	584	ug/L	1	-	-	Yes
Ç9 - C18 Aliphatics	212	ug/L	1	-	-	Yes
Ç19 - C36 Aliphatics	359	ug/L	1	-	-	Yes

Sample ID: MC46523-9MSD
Sample location: BMSMC Building 5 Area
Sampling date: 6/14/2016
Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	670	ug/L	1	-	-	Yes
Ç9 - C18 Aliphatics	225	ug/L	1	-	-	Yes
Ç19 - C36 Aliphatics	369	ug/L	1	-	-	Yes

DATA REVIEW WORKSHEETS

Type of validation Full: ☒ Limited: ☐ Project Number: MC46523 Date: 06/10-14/2016 Shipping date: 06/14/2016 EPA Region: 2

REVIEW OF EXTRACTABLE PETROLEUM HYDROCARBON (EPHs) PACKAGE

The following guidelines for evaluating volatile organics were created to delineate required validation actions. This document will assist the reviewer in using professional judgment to make more informed decision and in better serving the needs of the data users. The sample results were assessed according to the data validation guidance documents in the following order of precedence METHOD FOR THE DETERMINATION OF EXTRACTABLE PETROLEUM HYDROCARBONS (VPH), Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

The hardcopied (laboratory name) Accutest Laboratories data package received has been reviewed and the quality control and performance data summarized. The data review for SVOCs included:

Lab. Project/SDG No.: MC46523 Sample matrix: Groundwater/Soil
No. of Samples: 15
Field blank No.:
Equipment blank No.: MC46523-11
Trip blank No.:
Field duplicate No.: MC46523-4/ MC46523-5

<input checked="" type="checkbox"/> Data Completeness	<input checked="" type="checkbox"/> Laboratory Control Spikes
<input checked="" type="checkbox"/> Holding Times	<input checked="" type="checkbox"/> Field Duplicates
<input type="checkbox"/> GC/MS Tuning	<input checked="" type="checkbox"/> Calibrations
<input type="checkbox"/> Internal Standard Performance	<input checked="" type="checkbox"/> Compound Identifications
<input checked="" type="checkbox"/> Blanks	<input checked="" type="checkbox"/> Compound Quantitation
<input checked="" type="checkbox"/> Surrogate Recoveries	<input checked="" type="checkbox"/> Quantitation Limits
<input checked="" type="checkbox"/> Matrix Spike/Matrix Spike Duplicate	

Overall Comments:
Extractable Petroleum Hydrocarbons by GC by Method MADEP_EPH_REV_1.1.
(C9_to_C36_Aliphatics; C11_to_C22_Aromatics)

Definition of Qualifiers:

J- Estimated results
U- Compound not detected
R- Rejected data
UJ- Estimated nondetect

Reviewer: Rafael Infant Date: 07/17/2016

DATA REVIEW WORKSHEETS

All criteria were met x
Criteria were not met and/or see below

I. DATA COMPLETNESS

A. Data Package:

MISSING INFORMATION

DATE LAB. CONTACTED

DATE RECEIVED

B. Other

Discrepancies:

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

HOLDING TIMES

The objective of this parameter is to ascertain the validity of the results based on the holding time of the sample from time of collection to the time of extraction, and subsequently from the time of extraction to the time of analysis.

Complete table for all samples and note the analysis and/or preservation not within criteria

SAMPLE ID	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	ACTION
Samples extracted and analyzed within method recommended holding time				

Criteria

Preservation:

Aqueous samples must be acidified to a pH of 2.0 or less at the time of collection.

Soil samples must be cooled at 4 ± 2 °C immediately after collection.

Holding times:

Samples must be extracted within 14 days of collection, and analyzed within 40 days of extraction.

Cooler temperature (Criteria: 4 ± 2 °C): 1.5°C

Actions: Qualify positive results/nondetects as follows:

If holding times are exceeded, estimate positive results (J) and nondetects (UJ).

If holding times are grossly exceeded, use professional judgment to qualify data. The data reviewer may choose to estimate positive results (J) and rejects nondetects (R).

If samples were not at the proper temperature ($> 10^{\circ}\text{C}$) or improperly preserved, use professional judgment to qualify the results.

DATA REVIEW WORKSHEETS

All criteria were met X
 Criteria were not met and/or see below

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration: 06/22/16

Dates of initial calibration verification: 06/22/13

Instrument ID numbers: GCDE

Matrix/Level: AQUEOUS/MEDIUM

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
Initial and continuing calibration meet method specific requirements				

Criteria- ICAL

- Five point calibration curve.
- The percent relative standard deviation (%RSD) of the calibration factor must be equal to or less than 25% over the working range for the analyte of interest. When this condition is met, linearity through the origin may be assumed, and the average calibration factor is used in lieu of a calibration curve.
- A collective calibration factor must also be established for each hydrocarbon range of interest. Calculate the collective CFs for C9-C18 Aliphatic Hydrocarbons, C19-C36 Aliphatic Hydrocarbons, and C11-C22 Aromatic Hydrocarbons using the FID chromatogram. Tabulate the summation of the peak areas of all components in that fraction against the total concentration injected. The %RSD of the calibration factor must be equal to or less than 25% over the working range for the hydrocarbon range of interest.
 - The area for the surrogates must be subtracted from the area summation of the range in which they elute.
 - The areas associated with naphthalene and 2-methylnaphthalene in the aliphatic range standard must be subtracted from the uncorrected collective C9-C18 Aliphatic Hydrocarbon range area prior to calculating the CF.

DATA REVIEW WORKSHEETS

Criteria- CCAL

- At a minimum, the working calibration factor must be verified on each working day, after every 20 samples or every 24 hours (whichever is more frequent), and at the end of the analytical sequence by the injection of a mid-level continuing calibration standard to verify instrument performance and linearity.
- If the percent difference (%D) for any analyte varies from the predicted response by more than $\pm 25\%$, a new five-point calibration must be performed for that analyte. Greater percent differences are permissible for n-nonane. If the %D for n-nonane is greater than 30, note the nonconformance in the case narrative. It should be noted that the %Ds are calculated when CFs are used for the initial calibration and percent drifts are calculated when calibration curves using linear regression are used for the initial calibration.

Actions:

If %RSD > 25% for target compounds or a correlation coefficient < 0.99, estimate positive results (J) and use professional judgment to qualify nondetects.

If % D > 25% (> 30 for nonane), estimate positive results (J) and nondetects (UJ).

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration: _____ 06/22/16 _____

Dates of continuing calibration verification: _____ 06/27/15 _____

Dates of final calibration verification: _____ 06/28/16 _____

Instrument ID numbers: _____ GCDE _____

Matrix/Level: _____ AQUEOUS/MEDIUM _____

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
Initial and continuing calibration meet method specific requirements				

A separate worksheet should be filled for each initial curve

DATA REVIEW WORKSHEETS

All criteria were met _____
Criteria were not met and/or see below X

V A. BLANK ANALYSIS RESULTS (Sections 1 & 2)

The assessment of the blank analysis results is to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks apply only to blanks associated with the samples, including trip, equipment, and laboratory blanks. If problems with any blanks exist, all data associated with the case must be carefully evaluated to determine whether or not there is an inherent variability in the data for the case, or if the problem is an isolated occurrence not affecting other data. A Laboratory Method Blank must be run after samples suspected of being highly contaminated to determine if sample carryover has occurred.

List the contamination in the blanks below. High and low levels blanks must be treated separately.

Laboratory blanks

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS
<u> METHOD BLANKS MEET THE METHOD SPECIFIC CRITERIA EXCEPT FOR THE CASES DESCRIBED IN THIS DOCUMENT. </u>				
<u> 06/27/16 </u>	<u> OP47936-MB </u>	<u> Aqueous/low </u>	<u> C9-C18 (Aliphatics) </u>	<u> 18.5 ug/L </u>
<u> 06/27/16 </u>	<u> OP47936-MB </u>	<u> Aqueous/low </u>	<u> C19-C36 (Aliphatics) </u>	<u> 33.4 ug/L </u>

Note: No action taken, blank concentration below the reporting limit. The laboratory qualified the results with a B qualifier. No further qualification required.

Field/Trip/Equipment

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS
<u> NO TRIP/FIELD BLANKS ANALYZED ASSOCIATED WITH THIS DATA PACKAGE. ANALYTES NOT DETECTED IN THE EQUIPMENT BLANK EXCEPT IN THE CASES DESCRIBED IN THIS DOCUMENT. </u>				
<u> 06/27/16 </u>	<u> MC46523-11 </u>	<u> Aqueous/low </u>	<u> C9-C18 Aliphatics </u>	<u> 24.7 ug/l </u>
			<u> C19-C36 Aliphatics </u>	<u> 38.9 ug/l </u>

Note: No action taken, blank concentration below the reporting limit. The laboratory qualified the results with a B qualifier. No further qualification required.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

V B. BLANK ANALYSIS RESULTS (Section 3)

Blank Actions

The ALs for samples which have been diluted should be corrected for the sample dilution factor and/or % moisture, where applicable. Peaks must not be detected above the Reporting Limit within the retention time window of any analyte of interest. The hydrocarbon ranges must not be detected at a concentration greater than 10% of the most stringent MCP cleanup standard. Specific actions area as follows:

If the concentration is < sample quantitation limit (SQL) and < AL, report the compound as not detected (U) at the SQL.

If the concentration is \geq SQL but < AL, report the compound as not detected (U) at the reported concentration.

If the concentration is > AL, report the concentration unqualified.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

SURROGATE SPIKE RECOVERIES

Laboratory performance of individual samples is established by evaluation of surrogate spike recoveries. All samples are spiked with surrogate compounds prior to sample analysis. The accuracy of the analysis is measured by the surrogate percent recovery. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the validation of data is frequently subjective and demands analytical experience and professional judgment.

List the percent recoveries (%Rs) which do not meet the criteria for surrogate recovery.

Matrix: solid/aqueous

SAMPLE ID	SURROGATE COMPOUND				ACTION
	S1	S2	S3	S4	
<u>_SURROGATE_STANDARDS_RECOVERIES_WITHIN_LABORATORY_CONTROL_</u>					
<u>_LIMITS._</u>					

S1 = o-Terphenyl 40-140%

S2 = 2-Fluorobiphenyl 40-140%

S3 = 1-Chlorooctadecane 40-140%

S4 = 2-Bromonaphthalene 40-140%

QC Limits (%)* (Aqueous)

 LL to UL 40 to 140 40 to 140 40 to 140 40 to 140

QC Limits* (Solid)

 LL to UL to to to to

Note: No action, % recoveries within laboratory control limits in second column.

It is recommended that surrogate standard recoveries be monitored and documented on a continuing basis. At a minimum, when surrogate recovery from a sample, blank, or QC sample is less than 40% or more than 140%, check calculations to locate possible errors, check the fortifying standard solution for degradation, and check changes in instrument performance.

If the cause cannot be determined, reanalyze the sample unless one of the following exceptions applies:

- (1) Obvious interference is present on the chromatogram (e.g., unresolved complex mixture);
- (2) The surrogate exhibits high recovery and associated target analytes or hydrocarbon ranges are not detected in sample.

If a sample with a surrogate recovery outside of the acceptable range is not reanalyzed based on any of these aforementioned exceptions, this information must be noted on the data report form and discussed in the Executive Report. Analysis of the sample on dilution may diminish matrix-related surrogate recovery problems. This approach can be used as long as the reporting limits to evaluate applicable MCP standards can still be achieved with the dilution. If not, reanalysis without dilution must be performed.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

VII. A MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. This data alone cannot be used to evaluate the precision and accuracy of individual samples.

At the request of the data user, and in consideration of sample matrices and data quality objectives, matrix spikes and matrix duplicates may be analyzed with every batch of 20 samples or less per matrix.

- **Matrix duplicate** - Matrix duplicates are prepared by analyzing one sample in duplicate. The purpose of the matrix duplicates is to determine the homogeneity of the sample matrix as well as analytical precision. The RPD of detected results in the matrix duplicate samples must not exceed 50 when the results are greater than 5x the reporting limit.
- The desired spiking level is 50% of the highest calibration standard. However, the total concentration in the MS (including the MS and native concentration in the unspiked sample) should not exceed 75% of the highest calibration standard in order for a proper evaluation to be performed. The purpose of the matrix spike is to determine whether the sample matrix contributes bias to the analytical results. The corrected concentrations of each analyte within the matrix spiking solution must be within 40 - 140% of the true value. Lower recoveries of n-nonane are permissible but must be noted in the narrative if <30%.

MS/MSD Recoveries and Precision Criteria

Sample ID: MC46523-1_MS/MSD Matrix/Level: Groundwater
Sample ID: MC46523-9_MS/MSD Matrix/Level: Groundwater

List the %Rs, RPD of the compounds which do not meet the QC criteria.

MS OR MSD	COMPOUND	% R	RPD	QC LIMITS	ACTION

Note: MS/MSD % recoveries and RPD within laboratory control limits.

DATA REVIEW WORKSHEETS

All criteria were met X
 Criteria were not met and/or see below

No action is taken on MS/MSD results alone to qualify the entire case. However, used informed professional judgment, the data reviewer may use the MS/MSD results in conjunction with other QC criteria and determine the need for some qualification of the data. In those instances where it can be determined that the results of the MS/MSD affect only the sample spiked, the qualification should be limited to this sample alone. However, it may be determined through the MS/MSD results that the laboratory is having a systematic problem in the analysis of one or more analytes, which affects the associated samples.

2. MS/MSD – Unspiked Compounds

List the concentrations of the unspiked compounds and determine the % RSDs of these compounds in the unspiked sample, matrix spike, and matrix spike duplicate.

COMPOUND	CONCENTRATION		MSD	%RPD	ACTION
	SAMPLE	MS			

Criteria: None specified, use %RSD \leq 50 as professional judgment.

Actions:

If the % RSD > 50, qualify the results in the spiked sample as estimate (J).

If the % RSD is not calculable (NC) due to nondetect value in the sample, MS, and/or MSD, use professional judgment to qualify sample data.

A separate worksheet should be used for each MS/MSD pair.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

VIII. LABORATORY CONTROL SAMPLE (LCS/LCSD) ANALYSIS

This data is generated to determine accuracy of the analytical method for various matrices.

1. LCS Recoveries Criteria

List the %R of compounds which do not meet the criteria

LCS ID	COMPOUND	% R	QC LIMIT	ACTION
--------	----------	-----	----------	--------

LCS RECOVERY WITHIN LABORATORY CONTROL LIMITS

Criteria:

- * Refer to QAPP for specific criteria.
- * The spike recovery must be between 40% and 140%. Lower recoveries of n-nonane are permissible. If the recovery of n-nonane is <30%, note the nonconformance in the executive narrative. RPD between LCS/LCSD must be < 25%.

Actions:

Actions on LCS recovery should be based on both the number of compounds that are outside the %R and RPD criteria and the magnitude of the exceedance of the criteria.

If the %R of the analyte is > UL, qualify all positive results (j) for the affected analyte in the associated samples and accept nondetects.

If the %R of the analyte is < LL, qualify all positive results (j) and reject (R) nondetects for the affected analyte in the associated samples.

If more than half the compounds in the LCS are not within the required recovery criteria, qualify all positive results as (J) and reject nondetects (R) for all target analyte(s) in the associated samples.

2. Frequency Criteria:

Where LCS analyzed at the required frequency and for each matrix (1 per 20 samples per matrix)? **Yes** or No.

If no, the data may be affected. Use professional judgment to determine the severity of the effect and qualify data accordingly. Discuss any actions below and list the samples affected. Discuss the actions below:

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

IX. FIELD/LABORATORY DUPLICATE PRECISION

Sample IDs: MC46523-4/MC46523-5

Matrix: Groundwater

Field/laboratory duplicates samples may be taken and analyzed as an indication of overall precision. These analyses measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates which measures only laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.

COMPOUND	SQL	SAMPLE CONC.	DUPLICATE CONC.	RPD	ACTION
Field duplicate analyzed with this data package. RPD within laboratory and validation guidance document criteria (+ 50 % RPD) for analytes concentration \geq 5 SQL.					

Criteria:

The project QAPP should be reviewed for project-specific information.
RPD \pm 30% for aqueous samples, RPD \pm 50 % for solid samples if results are \geq SQL.
If both samples and duplicate are < 5 SQL, the RPD criteria is doubled.

SQL = soil quantitation limit

Actions:

If both the sample and the duplicate results are nondetects (ND), the RPD is not calculable (NC). No action is needed.

Qualify as estimated positive results (J) and nondetects (UJ) for the compound that exceeded the above criteria.

If one sample result is not detected and the other is ≥ 5 x the SQL qualify (J/UJ).

Note: If SQLs for the sample and duplicate are significantly different, use professional judgment to determine if qualification is appropriate.

If one sample value is not detected and the other is < 5 x the SQL, use professional judgment to determine if qualification is appropriate.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

XI. COMPOUND IDENTIFICATION

The compound identification evaluation is to verify that the laboratory correctly identified target analytes as well as tentatively identified compounds (TICs).

1. Verify that the target analytes were within the retention time windows.
 - Retention time windows must be re-established for each Target EPH Analyte each time a new GC column is installed, and must be verified and/or adjusted on a daily basis.
 - The n-nonane (n-C9) peak must be adequately resolved from the solvent front of the chromatographic run.
 - All surrogates must be adequately resolved from the Aliphatic Hydrocarbon and Aromatic Hydrocarbon standards.
 - For the purposes of this method, adequate resolution is assumed to be achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks.
 - The n-pentane (C5) and MtBE peaks must be adequately resolved from any solvent front that may be present on the FID and PID chromatograms, respectively.

- 1a. Aliphatic hydrocarbons range:
 - Determine the total area count for all peaks eluting 0.1 minutes before the retention time (Rt) for n-C9 and 0.01 minutes before the Rt for n-C19.
 - Determine the total area count for all peaks eluting 0.01 minutes before the Rt for n-C19 and 0.1 minutes after the Rt for n-C36.

Are the aliphatic hydrocarbons range properly determined?

Yes? or No?

Comments:

- 1b. Aromatic hydrocarbons range:
 - Determine the total area count for all peaks eluting 0.1 minutes before the retention time (Rt) for naphthalene and 0.1 minutes after the Rt for benzo(g,h,i)perylene.
 - Determine the peak area count for the sample surrogate (OTP) and fractionation surrogate(s). Subtract these values from the collective area count value.

Are the aliphatic hydrocarbons range properly determined?

Yes? or No?

Comments:

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

2. If target analytes and/or TICs were not correctly identified, request that the laboratory resubmit the corrected data.
3. Breakthrough determination - Each sample (field and QC sample) must be evaluated for potential breakthrough on a sample specific basis by evaluating the % recovery of the fractionation surrogate (2-bromonaphthalene) and on a batch basis by quantifying naphthalene and 2-methylnaphthalene in both the aliphatic and aromatic fractions of the LCS and LCSD. If either the concentration of naphthalene or 2-methylnaphthalene in the aliphatic fraction exceeds 5% of the total concentration for naphthalene or 2-methylnaphthalene in the LCS or LCSD, fractionation must be repeated on all archived batch extracts.

NOTE: The total concentration of naphthalene or 2-methylnaphthalene in the LCS/LCSD pair includes the summation of the concentration detected in the aliphatic fraction and the concentration detected in the aromatic fraction.

Comments: Concentration in the aliphatic fraction < 5% of the total
concentration for naphthalene and 2-methylnaphthalene

4. **Fractionation Check Standard** – A fractionation check solution is prepared containing 14 alkanes and 17 PAHs at a nominal concentration of 200 ng/μl of each constituent. The Fractionation Check Solution must be used to evaluate the fractionation efficiency of each new lot of silica gel/cartridges, and establish the optimum hexane volume required to efficiently elute aliphatic hydrocarbons while not allowing significant aromatic hydrocarbon breakthrough. For each analyte contained in the fractionation check solution, excluding n-nonane, the Percent Recovery must be between 40 and 140%. A 30% Recovery is acceptable for n-nonane.

Is a fractionation check standard analyzed?

Yes? or No?

Comments: Not applicable.

DATA REVIEW WORKSHEETS

All criteria were met X
Criteria were not met and/or see below

XII. QUANTITATION LIMITS AND SAMPLE RESULTS

The sample quantitation evaluation is to verify laboratory quantitation results.

In order to demonstrate the absence of aliphatic mass discrimination, the response ratio of C28 to C20 must be at least 0.85. If <0.85, this nonconformance must be noted in the laboratory case narrative.

The chromatograms of Continuing Calibration Standards for aromatics must be reviewed to ensure that there are no obvious signs of mass discrimination.

Is aliphatic mass discrimination observed in the sample? Yes? or No?

Is aromatic mass discrimination observed in the sample? Yes? or No?

1. In the space below, please show a minimum of one sample calculation:

MC46523-1 EPH (C11 – C22, Aromatics) RF = 124800

[] = (9858003)/(124800)

[] = 78.9 ug/ml Ok

MC46523-1 EPH (C19 – C36, Aliphatics) RF = 77820

[] = (2152855)/(77820)

[] = 27.7 ug/ml Ok

DATA REVIEW WORKSHEETS

2. If requested, verify that the results were above the laboratory method detection limit (MDLs).
3. If dilutions performed, were the SQLs elevated accordingly by the laboratory? List the affected samples and dilution factor in the table below.

SAMPLE ID	DILUTION FACTOR	REASON FOR DILUTION

If dilution was not performed, estimate results (J) for the affected compounds. List the affected samples/compounds:
